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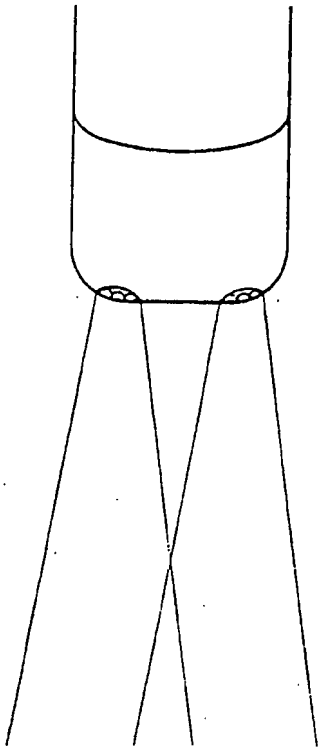
(54) Title: A DEVICE FOR AUTOMATIC SELECTIVE LIGHT CONTROL FOR VEHICLES

(57) Abstract

A device for automatic and selective light control of the headlights of vehicles is provided with a light sensitive detector that detects the distribution/intensity of light in the area in front of the vehicle. By the aid of a control unit said detector controls the light distribution pattern of the headlights of the vehicle in accordance with the distribution of the detected light. The headlights of the vehicle can be provided with intersecting directions of the axes of light beams. In this manner efficient dimming of the light may be achieved selectively in the areas where there are other vehicles, persons, or sources of light, whereas a maximum satisfactory illumination is maintained of the roadway in front of the vehicle.



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A device for automatic selective light control for vehicles

The present invention relates to a device for automatic selective light control, especially of the headlights of a vehicle, as stated in the preamble of claim 1.

When vehicles meet on a road in the dark problems often occur because the drivers are mutually blinded og because the headlights are dipped to such a degree that there is a hazard, e.g. to persons moving along the roadside. One cause of these problems may inter alia be the fact that the light is dipped in one step directly, so that there are no other possibilities than "too strong light" and "too little light". It is, thus, desirable to enable such control of the light that only the portion of the light that would inconvenience the driver of meeting cars is removed, leaving as much as possible of the roadway and the surroundings illuminated.

There have, thus, been several attempts at developing this kind of light control for vehicles. Among such known devices an embodiment may be mentioned where mechanical means are used and are either of a reflecting kind comprising mirrors, or are constructed as a dipping system. Furthermore, devices are known for dipping the light in two or more steps, although this has not resulted in a considerably improved arrangement. It is also known to equip the vehicle with light sensitive detectors scanning the light conditions in front of the vehicle and automatically adjusting the light intensity of the vehicle. Examples of equipment of the above mentioned kind is found in, e.g. GB 11 62 125, SE 360 605, and SE 374 702. None of these known systems, however, provided satisfactory dipping at the same time as best possible road illumination is achieved.

It is, thus, an object of the present invention to provide a device by the aid of which the light from a vehicle is dipped selectively and/or automatically in such a manner that only

that portion of the light is removed that would otherwise inconvenience the driver of oncoming cars. Furthermore, the light should be a minimum inconvenience to the driver of oncoming cars, at the same time as the roadway, the edges of the road, curves, etc. are satisfactorily illuminated. This object is achieved with a device characterized as stated in the claims.

The device according to the invention, thus, results in the fact that the light pattern in front of the vehicle is detected and the light emission from the vehicle controls a shadow pattern that conforms with the light pattern ahead. In this manner selective dimming in the areas where another vehicle is present will be achieved at the same time as the remaining roadway is kept well illuminated.

In an advantageous embodiment the headlights of the vehicle are arranged in such a manner that the light beams from them will intersect, so that the left headlight will illuminate the right lane, and vice versa. Oncoming vehicles will not be inconvenienced by the near-side, i.e. the left headlight in such a system, because the light from this direction will deviate from the direction of travel towards the right part of the road, whereas the left part of the road illuminated by the right side headlight can be eliminated to the necessary degree. The system of intersecting head light beams will also be advantageous when driving in curves, since the light beam from left head light will not inconvenience oncoming vehicles, and total dimming of both headlights can be avoided.

In the following the invention is disclosed in more detail with reference to embodiments shown in the accompanying drawings, where

Figure 1 diagrammatically illustrates the light pattern in front of a vehicle;

Figure 2 is a diagrammatical front view of the headlights on the vehicle according to Figure 1;

Figure 3 is a circuit diagram for controlling the headlights

Figure 4 shows an embodiment of the invention utilizing a layer of liquid crystals;

Figure 5 illustrates the light pattern in front of a vehicle that is equipped with intersecting light beams, diagrammatically shown; and

Figure 6 is a detailed elevation of the headlights of the vehicle shown in Figure 5.

The embodiment of Figures 1 - 3 shows a vehicle where the two headlights are constructed of three separate light sources L1, L2, and L3 placed side-by-side, and three light sources L4, L5, and L6 in a row beneath the first mentioned one. L1 - L6 in each headlight have directions of light that provide the best possible illumination in a desired predetermined area in front of the vehicle.

The lower row comprising lamps L4, L5, and L6 has a low angle of light corresponding to normal driving light, and this row must be able to take over the illumination automatically as the upper lamps are switched off. Further organization of the system according to the invention may comprise all lamps apart from L5 or L2 to be controlled for still more effective dimming.

The detector system for controlling the light sources may comprise light sensitive photo-electronic diodes or transistors F1, F2, F3, mounted in a receiver that may, e.g. be placed in the driving mirror of the vehicle. The light sensitive elements can be arranged in such a manner that each main light of the headlight has its own sensor and the sensor only covers the same area as the light beam from its lamp. According to the invention this is achieved by placing sensors and by using small parabolic reflectors or collimator tubes for direction and angle of expansion which scan the same area of light which the lamp creates by its illumination. The electric signals from the sensors via Schmidt-triggers IZ1 can then control the bases of transistors T1 - T6 and the lamps off and on. The light sources can also be dimmed gradually, one at a time, in accordance

In this manner dipping of the headlights or light beams that would have illuminated the areas that emit/reflect light is achieved.

A more simple system according to the invention can also be implemented with existing light systems by the aid of liquid crystals in the front pane of the lamp or on reflectors to dim the portion of the light conus corresponding to the field of vision of the sensors in stead of switching off or dipping the source of light. Such a possibility is shown in Figure 4. In said Figure 7 is an objective, 8 is a photographic plate, 9 is an electronic processor, 10 is the filament of the headlight, 11 is a glass pane, 12 indicates liquid crystals, and 13 is a reflector. The pattern of light in the field of the driver's vision will be caught by objective 7,that is placed inside the windscreen of the car, and will be transmitted to a photographic plate 8 that is divided into dots. Light from a.c. sources can be filtered out in the electronic processor 9 of the system. Influences on the system from buildings, street lighting, etc. are, thus, avoided. Microprocessor 9 continuously processes the light signals arriving at the photographic plate and continuously emits control signals to a transparent plate 11 with liquid crystals 12. Said plate corresponds, dot by dot, with the photographic plate behind said objective. It is placed inside the headlight of the car in such a relationship to the bulb and the reflector that when portions of the photographic plate are influenced by light, corresponding portions of the glass plate are obscured by the liquid crystals 12. A continuous and nuanced dimming process is, thus achieved, said process being stepless and providing a shadow pattern which is a direct result of the light pattern detected by the objective.

The embodiment as shown in Figure 5 illustrates a special case where a vehicle is provided with two headlights constructed of several separate light sources 1, 2, and 3 that are placed side-by-side. Light sources 1, 2, and 3 of each headlight have

directions of light intersecting at a desired distance a from the vehicle . The effect will, thus, be an illumination by light cones in front of the vehicle that are added into a total light area at a desired distance b in front of the vehicle, and then are separated in opposed directions, i.e. the source of light furthest to the left in the vehicle headlight will illuminate the right side of the road.

Additionally, a lower row of lamps having a low light angle and corresponding to general driving light may be arranged. Said lower lamps may take over automatically in case of dimming, as the upper lamps are switched off. The system may also be arranged so as to make the light cones from upper and lower row intersect with reference to the horizontal plane as well at a determined distance a in front of the vehicle. Said lower row will then function as a high beam system and the upper row as driving light. Further organization of the system may comprise control of all lights, apart from the center lamps in each light in order to achieve a still more efficient dimming.

Such an arrangement of the headlights with intersecting light beams permits more efficient dimming of the light, and at the same time the roadway is satisfactorily dimmed, the outer light (closest to the center of the roadway) being directed inward, toward the roadside and not blinding oncoming cars, but efficiently illuminating the roadside. This light will, at the same time indicate the outside boundaries of the vehicle in an efficient manner.

The angular setting may be firm, but combined with automatic dimming, e.g. as disclosed above. The angular setting may, on the other hand, be adjustable, either manually or automatically and adjustment may be controlled by the light sensitive sensor detecting the light conditions in fromt of the vehicle.

The device according to the invention can readily be provided based on an existing headlight system, or it may be constructed with special lamps, e.g. consisting of separate headlights

arranged in groups, as indicated above. What is essential in the invention is, thus, an improvement to prevent blinding oncoming vehicles. The above mentioned only indicates possibilities of implementing the system, many modifications being possible within the scope of the invention.

CLAIMS:

1. A device for automatic and manual selective light control, especially for the headlights of vehicles, comprising a light sensitive detector, e.g. provided in the driving mirror, for detecting the division/intensity of light in the area in front of the vehicle, said detector, via a control unit, controlling the light in the headlights of said vehicle in step with the light detected by said detector, c h a r a c t e r i z e d i n that said detector for detecting the distribution/intensity of light dot-by-dot is constructed as a depicting means, or comprises a plurality of directional photo-electric sensors that provide control of a light/shadow pattern for the headlights in accordance with the detected light distribution pattern.

2. A device as defined in claim 1, c h a r a c t e r i z e d i n that the detector has a detecting area with the same image field as the field of illumination of the high beams of said vehicle at the distance necessitating dimming.

3. A device as defined in claim 1 and/or 2, c h a r a c t e r i z e d i n that said headlights are constructed as composite sources of light, consisting of several directional separate headlights in groups, said separate headlights being individually dimable by said detector.

4. A device as defined in claim 3, c h a r a c t e r i z e d i n that said directional photo-electronic sensors are arranged in a pattern corresponding to the directions of the headlights in the bank.

5. A device as defined in claim 1, c h a r a c t e r i z e d i n that said headlights are provided with a layer of liquid crystals in front of the source of light, alternatively on the reflector, and that said layer is controlled by the detector device for forming a light/shadow pattern at the distance necessitating dimming.

6. A device as defined in claim 1, c h a r a c t e r i z e d i n that the detector is a photographic depicting means known per se, e.g. a video camera or a parabolic reflector, where the formed pattern of light may be electronically scanned.

7. A device as defined in one or several of the preceding claims, c h a r a c t e r i z e d i n that it is used in a system where the headlights of the vehicle are arranged with firmly set, intersecting axes of light emision (1 - 3), said licht being set for illuminating the necessary area in front of the vehicle.

8. A device as defined in claim 7, where said headlights are provided with inserts of a plurality of directional separate headlights in groups, c h a r a c t e r i z e d i n that the light beams of the separate headlights in said inserts are also provided with intersecting axes of light emision.

9. A device as defined in claim 7 or 8, c h a r a c t e r i z e d i n that the headlights and/or separate headlights of inserts in the vehicle are adjustable as regards the angle of intersection and dimming by the aid of a control means that is controlled by the light sensitive detector scanning the position of distribution of light and dark areas in front of the vehicle.

10. A device as defined in one or several of claims 7-9, c h a r a c t e r i z e d i n that a control means is provided for manual dimming a desired portion of the light from the headlights of the vehicle.

Fig.1.

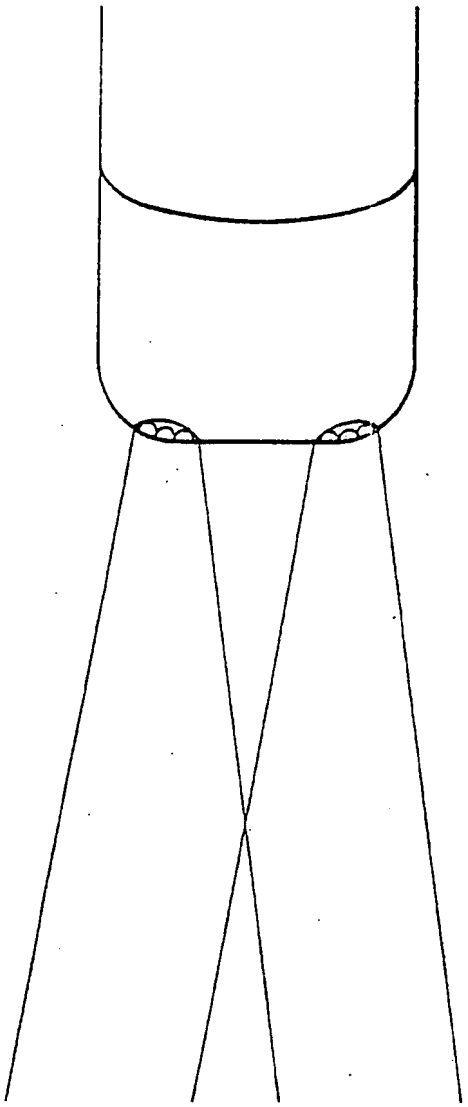


Fig.2.

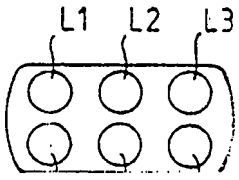


Fig.3.

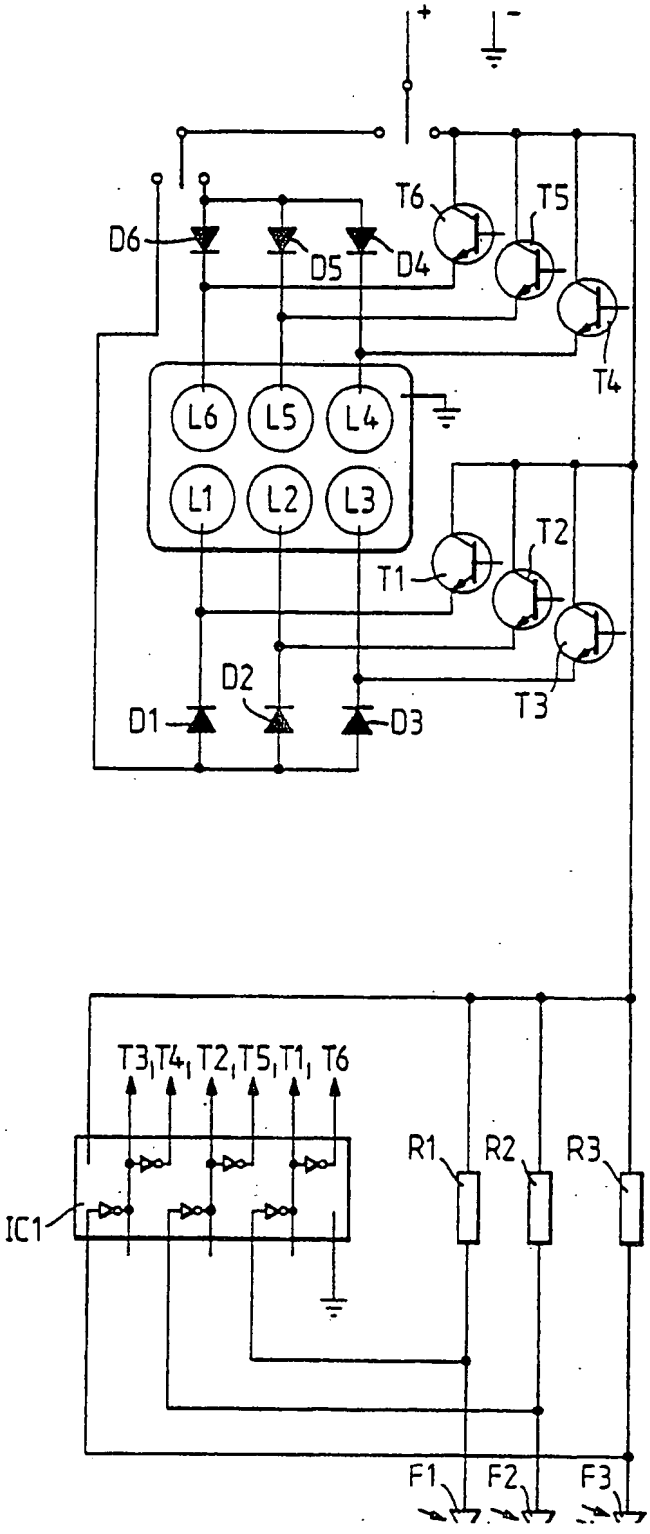


Fig.4.

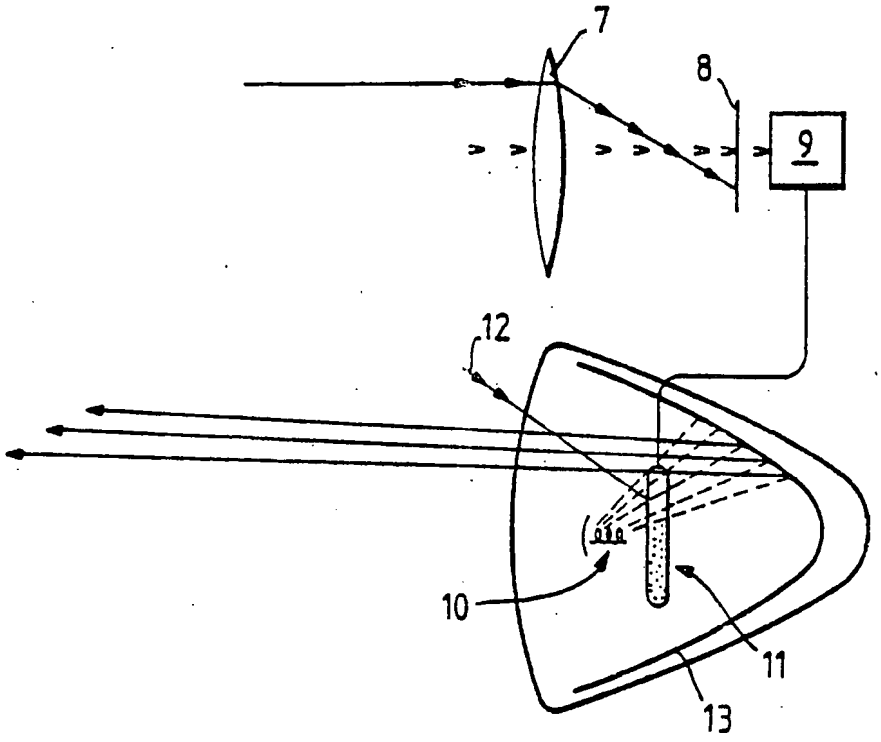


Fig.5.

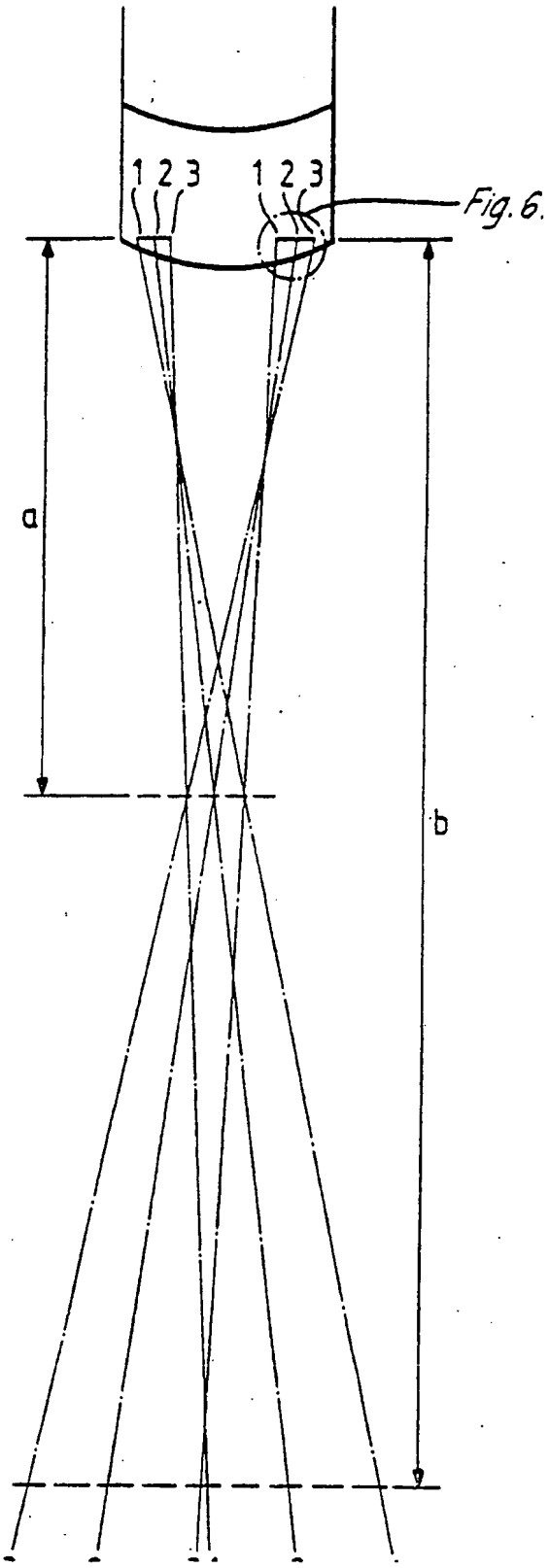
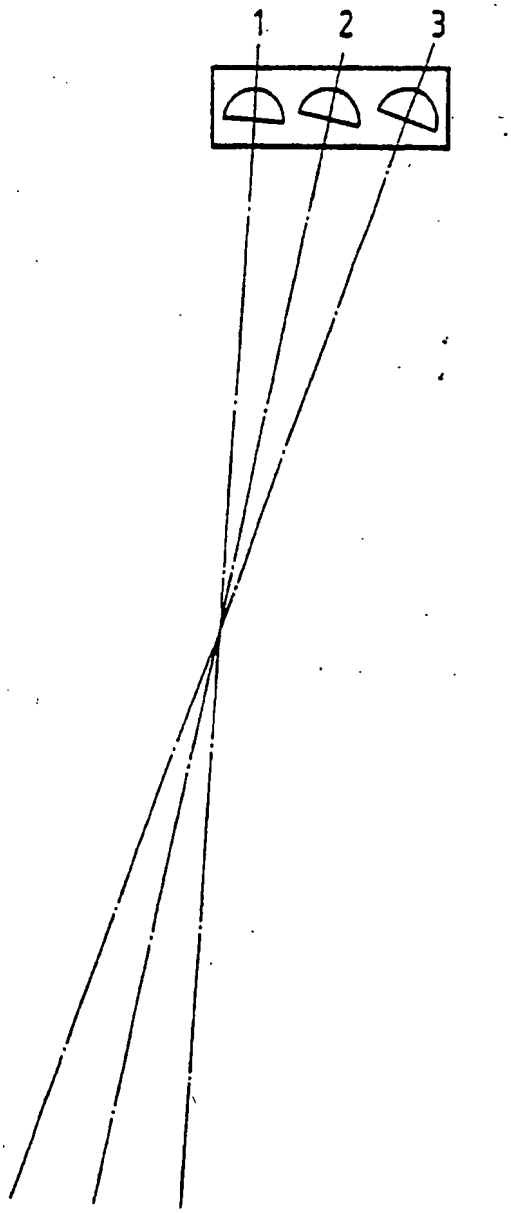


Fig.6.



I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

B 60 Q 1/14, F 21 M 3/04

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC.4	B 60 Q 1/14; F 21 M 3/04, /06, /08, /10
Nat Cl	63c:63/20,65
US Cl	315:82, 83; 240:46, 07

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1986-05-15	1986 -05- 21
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Carl-Albert Lannefors

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

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